U.S. Department of Transportation
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The Impact of Traffic on Residential Areas

June 1982

An Urban Consortium Information Bulletin

Urban Consortium for Technology Initiatives

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The Urban Consortium for Technology Initiatives was formed to pursue technological solutions to pressing urban problems. The Urban Consortium is a coalition of 37 major urban governments, 28 cities and 9 counties, with populations over 500,000. These 37 governments represent over 20% of the nation's population and have a combined purchasing power of over $25 billion.

Formed in 1974, the Urban Consortium represents a unified local government market for new technologies. The Consortium is organized to encourage public and private investment to develop new products or systems which will improve delivery of local public services and provide cost-effective solutions to urban problems. The Consortium also serves as a clearinghouse in the coordination and application of existing technology and information.

To achieve its goal, the Urban Consortium identifies the common needs of its members, establishes priorities, stimulates investment from Federal, private and other sources and then provides on-site technical assistance to assure that solutions will be applied. The work of the Consortium is focused through 10 task forces: Community and Economic Development; Criminal Justice; Environmental Services; Energy; Fire Safety and Disaster Preparedness; Health; Human Resources; Management, Finance and Personnel; Public Works and Public Utilities; and Transportation.

Public Technology, Inc. is the applied science and technology organization of the National League of Cities and the International City Management Association. It is a nonprofit, tax-exempt, public interest organization established in December 1971 by local governments and their public interest groups. Its purpose is to help local governments improve services and cut costs through practical use of applied science and technology. PTI sponsors the nation's local government cooperative research development, and technology transfer program.

PTI's Board of Directors consists of the executive directors of the International City Management Association and the National League of Cities, plus managers and elected officials from across the United States.

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Washington, D.C. 20004

Secretariat to the

URBAN CONSORTIUM FOR TECHNOLOGY INITIATIVES

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PREFACE

This is one of ten bulletins in the fifth series of Information Bulletins produced by the Transportation Task Force of the Urban Consortium for Technology Initiatives. Each bulletin in this series addresses a priority transportation need identified by member jurisdictions of the Urban Consortium. The bulletins are prepared for the Transportation Task Force by the staff of Public Technology, Inc. and its consultants.

Ten newly identified transportation needs are covered in this fifth series of Information Bulletins. In priority order they are:

- Growth Management and Transportation
- Intercepting Downtown-Bound Traffic
- Inflation Responsive Transit Financing
- Impact of Traffic on Residential Areas
- Coordination of Parking with Public Transportation and Ridesharing
- Improved Railroad Grade Crossings
- Flexible Federal Design Standards for Highway Improvements
- Traffic Signal Maintenance
- Inflation Responsive Financing for Streets and Highways
- Flexible Parking Requirements

The needs highlighted by Information Bulletins are selected in an annual process of needs identification used by the Urban Consortium. By focusing on the priority needs of member jurisdictions, the Consortium assures that resultant research and development efforts are responsive to local government problems.

Each bulletin provides a nontechnical overview, from the local government perspective, of issues and problems associated with each need. Current research efforts and approaches to the problem are identified. The bulletins are not an in-depth review of the state-of-the-art or the state-of-the-practice. Rather, they serve to identify and raise issues and as an information base from which the Transportation Task Force selects topics that require a more substantial research effort.

The Information Bulletins are also useful to those, such as elected officials, for whom transportation is but one of many areas of concern.

The needs selection process used by the Urban Consortium is effective. Priority needs selections have been addressed by subsequent Transportation Task Force projects:

- To facilitate the provision of transportation services for elderly and handicapped people, five products have been developed: Elderly and Handicapped Transportation: Chief Executive's Summary, Elderly and Handicapped Transportation: Planning Checklist, Elderly and Handicapped Transportation: Information Sourcebook, Elderly and Handicapped Transportation: Eight Case Studies.

- To help improve center city circulation (with the objectives of downtown revitalization and economic development) several projects have been completed. A summary report on Center City Environment and Transportation: Local Government Solutions shows how 7 cities use transportation and pedestrian improvements as tools in downtown revitalization. A report titled Center City Environment and Transportation: Transportation Innovations in Five European Cities discusses exemplary approaches to resolving traffic management problems common to cities with large numbers of automobiles. Another project, addressing the coordination of public transportation investment with real estate development, has culminated in two major national conferences--the Joint Development Marketplaces I and II. The second Marketplace, held in Washington, DC, in July 1980, was attended by a total of over 500 people, including exhibitors from 32 cities and counties and representatives of private development and financial organizations.

- A series of documents relating to the need for Transportation Planning and Impact Forecasting Tools has been prepared: (1) a management-level document for local officials describing manual and computer transportation planning tools available from the U.S. Department of Transportation, (2) a series of case studies of local government and transit agency applications of these tools, and (3) a guide describing ways local governments can gain access to these tools.

- To meet the need to promote the use of Transportation System Management (TSM) measures, a series of five regional meetings was held in 1980 to provide local, State, and Federal officials, and representatives of transit agencies and the business community with the opportunity to exchange information about low-cost TSM projects to improve existing transportation systems.

- To facilitate the dissemination of information on local experiences in Parking Management, a technical report describing the state-of-the-art has been prepared.

- To address the need for information on transit productivity, a seminar on International Transit Performance Measurement was held in September 1980. The seminar included presentations on the state-of-the-art in France, Germany, and the United States. The seminar was co-sponsored by the German Marshall Fund of the United States.

- To encourage improved design in transportation facilities, PTI organized Design for Moving People, the first national conference to bring together leading design professionals--architects, artists, arts administrators--and those responsible for operating and managing many of the nation's largest public mass transportation systems. The meeting was held in May 1981 in New York. Cosponsored by the American Public Transit Association (APTA), the New York Chapter of the American Institute of Architects, AMTRAK, and the Municipal Art Society of New York, the two day conference featured keynote addresses by two of the country's leading architects, case studies, and practical workshops on topics such as financing design excellence, promoting better collaboration between architects and artists, and materials selection--vandalism and maintenance.

- To address the issue of adequate financing for transit and the difficult policy decisions facing operating authorities regarding fare setting and the role fares should play in meeting financial needs, the Urban Mass Transportation Administration (UMTA) and the American Public Transit Association (APTA) sponsored a fare policy seminar, with the help of PTI, for general managers and board members in Region III. The seminar was held in Washington, D.C. in September 1981, at APTA's offices. Consulting experts presented the results of relevant research sponsored by UMTA's Office of Service and Methods Demonstrations.

- To test the effectiveness of the video teleconference as a means of communicating information to local officials quickly and efficiently and to address the need to find less costly alternatives to fixed route transit, PTI organized and staffed a successful teleconference under UMTA sponsorship in 1982. Entitled "Adjusting to Reduced Transportation Budgets: Operational Strategies," the teleconference provided local officials in five cities with information about alternative transportation services suitable for areas where conventional transit service is either impractical or unduly expensive.

Task Force information dissemination and technology sharing concerns are currently addressed by three products--SMD Briefs, Transit Actions and Transit Technology Briefs. SMD Briefs are short reports that provide up-to-date information about specific aspects of on-going projects of UMTA's Office of Service and Methods Demonstrations (SMD). In addition, the SMD HOST Program allows transportation officials from selected jurisdictions to visit one of these projects for on-site training. Transit

Actions cover the on-going projects of UMTA's Office of Transportation Management. Each Action provides timely information that will be especially useful to transit managers concerned with improving their transit systems' efficiency and effectiveness. Transit Technology Briefs report on projects sponsored by UMTA's Office of Technology Development and Deployment. These timely documents provide information that should be of direct benefit in the improvement and productivity of transit system operations.

Additional Technology Sharing occurs through the National Cooperative Transit Research Program (NCTRP) which was organized jointly by Public Technology, Inc., the American Public Transit Association, the Urban Mass Transportation Administration, and the Transportation Research Board to address problems relating to public transportation identified by local and State government and transit administrators.

The support of the U.S. Department of Transportation's Technology Sharing Division in the Office of the Secretary, Federal Highway Administration, National Highway Traffic Safety Administration, and Urban Mass Transportation Administration has been invaluable in the work of the Transportation Task Force of the Urban Consortium and the Public Technology, Inc. staff. The guidance offered by the Task Force members will continue to ensure that the work of the staff will meet the urgent needs identified by members of the Urban Consortium for Technology Initiatives.

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ISSUES AND PROBLEMS

Until recently, the effects of motor vehicle traffic on the quality of urban residential environments have been largely neglected as a transportation problem. In the past decade, however, a number of converging forces have brought these effects to the attention of both citizens and local transportation officials. Countless local governments, often under intense public pressure, have taken actions to reduce the speed and volume of traffic on neighborhood streets.

Increasing levels of automobile ownership, smaller household size, and longer trip lengths prompted by unbalanced land development and neglect of short-trip transportation needs in urban areas are resulting in continued traffic growth. Capital shortages, soaring construction costs, and environmental concerns concurrently are limiting future expansion of transportation infrastructure. As a result, congestion on arterial streets in urban and suburban areas is increasing in most cities, and more traffic is diverting to residential streets to bypass congestion. Even where traffic volumes are not large, speeding vehicles on residential streets often prompt citizen concern and protest.

While automobile restraint in residential areas has been demonstrated as an effective strategy for improving the safety and quality of urban life, it is a challenging task from a political and institutional standpoint. Techniques appropriate and successful in one context often must be altered for application in a different setting. In many cases, the success of neighborhood traffic control programs is dependent more on effective coalition-building and public participation than on the traffic engineering technologies used.

This Information Bulletin provides a brief review of the issues facing local governments as they work to reduce the effects of traffic on residential areas, including:

- Impacts of traffic on residential areas.
- Strategies for neighborhood traffic management.
- Issues in developing successful neighborhood traffic control problems.
- Analyzing problems and evaluating solutions.
- Warrants and legal issues.

IMPACTS OF TRAFFIC ON RESIDENTIAL AREAS

Motor vehicle traffic is a pervasive element in American metropolitan areas. While most urban and suburban residents are accustomed to the presence of traffic in their living environment and prize the mobility offered by the automobile, many are discontented with the effects of traffic in their neighborhoods.

Donald Appleyard, author of Livable Streets, has summarized the perceptions of many citizens, saying that traffic "has a pervasive and repressive effect. It dominates the street space, it penetrates right through the houses, it prevents neighboring, thwarts street play, interferes with the intimacy of the home, spreads dust, fumes, noise, and litter, forces rigid controls over children's behavior, frightens old people, and kills or maims a goodly number of citizens every year."[1]

In a recent U.S. Census Bureau survey of housing in metropolitan areas, 46% of the 51,000 people surveyed reported that street noise was the single most undesirable characteristic of their neighborhoods. In central city residential areas, this figure climbed to 51%. Survey respondents considered street noise to be more of a problem than crime, trash and litter, deteriorated buildings, and many other well publicized problems.[2]

Traffic noise levels have been found to double each time vehicle speed is doubled and to increase by 30% when the traffic volume is doubled. The frequency of occurrence of peak noise levels varies directly with the traffic density.[3]

Although individual human response to street noise varies significantly, there is a strong correlation between subjective and objective noise levels.[4] Numerous studies have documented the damaging psychological and physiological effects of loud or persistent noise in living and working environments. The American Medical Association now considers noise to be a general health hazard--one that is on the same level as water, air, and solid waste pollution.[5]

Pedestrian Safety

The danger of motor vehicle-pedestrian accidents in residential areas is strongly related to the speed and volumes of traffic on neighborhood streets. Children and the elderly are most vulnerable to this threat.

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[1]As quoted in Daniel S. Brody, "Street Talk from an Expert," Planning, Vol 47, No. 8, (August 1981) p. 28.

[2]U.S. Census, 1976, Department of Housing and Urban Development, "Annual Housing Survey: 1976. U.S. and Regions," Part B, Indicators of Housing and Neighborhood Quality, Series H-150-76B, (Washington, D.C., U.S. Government Printing Office) p. 53.

[3]OECD (Organization for Economic Cooperation and Development), Urban Traffic Noise: Status of Research and Legislation in Different Countries, (Paris, OECD).

[4]D.G. Harland, Units for Exposure and Response to Traffic Noise, Transport and Road Research Laboratory, SR 297 (Crowthorne, England: 1977).

[5]Marjorie Rachelson Samuels, "Hear No Evil: The Effect of High-Intensity Aircraft Noise," Environmental Comment (September 1981) p. 10.

In 1979, pedestrian fatal accidents represented 35% of all traffic deaths in urban areas and urban pedestrian facilities constituted 71% of all pedestrian fatalities. Over 25% of those killed and almost 15% of those injured in pedestrian accidents were under 15 years of age.[6] Those over the age of 60 represent the next largest group involved in pedestrian accidents.

Three-fourths of all pedestrian accidents involving children occur in the vicinity of their homes, often on streets with low traffic volumes. The child is the cause of over 70% of these accidents.[7] Lacking the perceptual and conditional skills needed to predict and react to traffic movement, Children cannot adapt safely to the traffic environment. Despite this, the neighborhood street is a primary play-space for many children.

Parental concern over child safety has been the major motivation for many citizen protests about traffic on residential streets and helps account for the frequent political volatility of neighborhood traffic management issues.

Air Pollution

Although air pollution is rarely severe enough in U.S. cities to be directly noticed as an environmental disturbance, it has major effects on the health of urban residents. Carbon monoxide, nitrogen oxides, sulphur dioxide, hydrocarbons, and lead compounds are present in motor vehicle emissions. All cause health problems in humans at low levels of concentration.

Restrictions on automobile use in small areas have been shown to reduce pollution levels substantially for all of these substances, except sulphur dioxide, within the area surrounding small traffic-free zones.[8] Children are particularly threatened by lead from automobile emissions, which has been found at dangerous levels in dust in gutters, on sidewalks, and in the grass and vegetation along arterials. Lead concentrations vary directly with traffic volume.[9,10]

Community Cohesion

Research done in San Francisco neighborhoods has shown a strong inverse relationship between social interaction among neighbors and the amount of traf-

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[6]National Safety Council, Accident Facts. (Chicago, Illinois: 1980).

[7]Frederick Van Antwerp, The Restraints of the Automobile in Established Residential Areas: An Implementation Policy Analysis, Pennsylvania Transportation Institute, Pennsylvania State University (University Park, Pennsylvania: 1979) p. 8-9.

[8]Pita L. Ramundo, "Air Pollution in Traffic-Free Zones and Surrounding Areas," Roads and the Urban Environment, (Paris: OECD, 1975) p. 94-100.

[9]C. Patrick Scanton Goldsmith, and Walter Price, "Lead Concentrations in Soil and Vegetation Associated with Different Traffic Densities," Bulletin of Environmental Contamination and Toxicology, 16, (1976) p. 66-70.

[10]M.J. Duggan and S. Williams, "Lead and Dust in City Streets," Science of the Total Environment, 7 (1977). p. 91-97.

fic on the street. Traffic inhibits neighbors from meeting and talking on the sidewalk or in front yards and reduces the acceptability of areas adjoining the street for child play.[11] Dwelling units may be designed or used so that major activities take place away from the street front. Heavily-travelled residential streets are more likely to attract short-term residents with fewer children than are less travelled streets.

The most serious problems are likely to occur where traffic densities were not anticipated by incoming residents and where traffic volumes have increased substantially over time. In these instances, according to the University of California study, street traffic may have a seriously adverse effect on the residents' perception of the status of the street, residents may withdraw almost entirely from street life, and residential land values may deteriorate. Excess traffic on residential streets thus can contribute to reduced community cohesion and a lower quality social environment.

There is evidence that streets with greater automobile accessibility may be more susceptible to residential crime such as burglaries.[12] This is consistent with Jane Jacobs' observations regarding the importance of an active street-life in reducing neighborhood crime and feeling of insecurity.[13]

Property Values

A recent study of two contiguous neighborhoods, similar in all respects save that in one a residential traffic management plan was developed and enforced, found that over a thirty year period, residential property values increased substantially in the neighborhood with the traffic management plan over those in the other neighborhood.[14] The increased property values enhanced the tax base of the city.

STRATEGIES FOR NEIGHBORHOOD TRAFFIC MANAGEMENT

Numerous strategies for neighborhood traffic management have been used in American cities. Some streets are naturally protected from heavy traffic and excessive speeds by steep hills, winding roadways, and street discontinuities created by such terrain features as streams, ravines, and open space. In many areas, particularly in planned subdivisions, these natural effects may be reproduced by lot location, grading use of curvilinear streets, and creating discontinuities in the roadway network.

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[11]Donald Appleyard, Livable Streets, (Berkeley: University of California Press, 1981.)

[12]Carol Bevis and Julia Nutter, "Changing Street Layouts to Reduce Residential Burglary," Annual Meeting of the American Society of Criminology (Atlanta, 1977).

[13]Jane Jacobs, Death and Life of Great American Cities.

[14]D. Gordon Bagby, "Effects of Traffic Flow on Residential Property Values," American Planning Association Journal, 46 (1980) pp. 88-94.

Protection in older residential areas, however, must usually be accomplished by purely artificial controls. Some of the controls that have been used for this purpose are:

- Channelization.
- Cul-de-sacs.
- Speed humps (undulations).
- Islands.
- One-way entrances or exits to two-way streets.
- One-way streets back-to-back.
- Retention or restoration of on-street parking.
- Rumble strips.
- Speed and warning signs.
- Speed bumps (used primarily on private streets).
- Stop signs (alternate intersections).
- Stop signs (2-, 3-, 4-way).
- Street narrowing and necked intersections.
- Installation of bicycle lanes to reduce street width.
- Radar surveillance and speed enforcement.
- Traffic circles.
- Traffic diverters.
- Traffic signals.
- Truck restrictions.
- Turn restrictions.
- Play streets programs.
- Woonerf streets.
- Street closing (permanent or during certain hours only).
- Grid and cell traffic systems.

While most of these techniques have been used for many years and are well known to planners and engineers, there is considerable disagreement about the benefits and problems associated with many of these strategies. Figure 1 presents the findings of a recent FHWA report regarding characteristics and effects of selected neighborhood traffic control devices.

Although the scope of this report precludes discussion of each of these techniques in detail, a few strategies that are not widely known are reviewed in Figure 2. Discussion of other strategies may be found in the recent FHWA publication, State of the Art Report: Residential Traffic Management (see Bibliography, p. 34).

Finally, it should be stressed that local planners and engineers may encounter problems that require unique solutions not identified in any literature. A case in point is the example of the neighborhood in Washington, D.C. that was plagued by tour buses driving by the residence of a celebrity. The solution was a ban on bus turns in the neighborhood, but references to bus turns do not appear in neighborhood traffic control literature.

Figure 1

TRAFFIC EFFECTS AND CHARACTERISTICS OF SELECTED NEIGHBORHOOD TRAFFIC CONTROL DEVICES
DIRECT TRAFFIC EFFECTS*

DEVICES	Volume Reductions	Speed Reductions	Directional Control	Change In Composition	Noise	Safety	Emergency & Service Access
Physical Controls							
Speed Bumps	Possible	Inconsistent	Unlikely	Unlikely	Increase	Adverse effects	Some problems
Undulations	Possible	Yes	Unlikely	Unlikely	No change	No problems documented	No problems documented
Rumble Strips	Unlikely	Yes	Unlikely	Unlikely	Increase	Improved	No problems
Diagonal Diverters	Yes	Likely	Possible	Possible	Decrease	Shifts accidents	Some constraints
Intersection Cul-De-Sac	Yes	Likely	Yes	Possible	Decrease	Shifts accidents	Some constraints
Midblock Cul-De-Sac	Yes	Likely	Yes	Possible	Decrease	Shifts accidents	Some constraints
Semi-Diverter	Yes	Likely	Yes	Possible	Decrease	Shifts accidents	Minor constraints
Forced Turn Channelization	Yes	Likely	Yes	Posible	Decrease	Improved	Minor constraints
Median Barriers	Yes	On curves	Possible	Possible	Decrease	Improved	Minor constraints
Traffic Circle	Unclear	Minor	Unlikely	Possible	Little change	Questionable	Some constraints
Chokers and Road Narrowing	Rare	Minor	Unlikely	Unlikely	Little change	Improved ped. crossings	No problems
Passive Controls							
Stop Signs	Occasional	Site red.	Unlikely	Unlikely	Increase	Mixed results	No problems
Speed Limit Signs	Unlikely	Unlikely	Unlikely	Unlikely	No change	No change	No effect
Turn Prohibition Signs	Yes	Likely	Yes	Possible	Decrease	Improved	No effect
One-Way Streets	Yes	Inconsistent	Yes	Possible	Decrease	Possible imp.	No effect
Psycho-Perception Controls							
Transverse Markings	No change	Yes	No effect	No effect	Possible red.	Possible imp.	No effect
Crosswalks	No effect	Unlikely	No effect	No effect	No effect	Ineffective	No effect
Odd Speed Limit Signs	No effect	No effect	No effect	No effect	No effect	No efect	No effect
Novelty Signs	No effect	Undocumented	No effect	No effect	Unlikely	No effect	No effect
Comprehensive Approaches							
Woonerf	Yes	Yes	Unlikely	Possible	Decrease	Improved	Possible constraints
Traffic Cell	Yes	Unlikely	Yes	Possible	Decrease	Possible imp.	No problems

*Specific details of individual applications may result in performance substantially different from descriptions noted above. See FHWA report for more complete performance data, asessments, and qualifications.

Source: Smith and Appleyard (1980) p. 22-23. (adapted)

Figure 1 (continued)

TRAFFIC EFFECTS AND CHARACTERISTICS OF SELECTED NEIGHBORHOOD TRAFFIC CONTROL DEVICES
OTHER CHARACTERISTICS

DEVICES	Construction Effort & Cost	Landscape Opportunity	Site or Systems Use	Maintenance & Operational Effects Index
Physical Controls				
Speed Bumps	Low	None	Both	Snowplow problems
Undulations	Low	None	Both	No problems noted
Rumble Strips	Low	None	Site	Snowplow problems
Diagonal Diverters	Moderate to high	Yes	Usually system	Vandalism
Intersection Cul-De-Sac	Moderate to high	Yes	Both	Vandalism
Midblock Cul-De-Sac	Moderate to high	Yes	Both	Vandalism
Semi-Diverter	Moderate to high	Yes	Both	Vandalism
Forced Turn Channelization	Moderate	Possible	Both	No unusual problems
Median Barriers	Moderate	Posible	Both	No unusual problems
Traffic Circle	Moderate to high	Yes	Both	Vandalism
Chokers and Road Narrowing	Moderate	Yes	Both	No unusual problems
Passive Controls				
Stop Signs	Low	No	Both	No unusual problems
Speed Limit Signs	Low	No	Site	No unusual problems
Turn Prohibition Signs	Low	No	Both	No unusual problems
One-Way Streets	Low	No	Usually system	No unusual problems
Psycho-Perception Controls				
Transverse Markings	Low	No	Site	No unusual problems
Crosswalks	Low	No	Site	No unusual problems
Odd Speed Limit Signs	Low	No	Site	Vandalism
Novelty Signs	Low	No	Site	Vandalism
Comprehensive Approaches				
Woonerf	Moderate to high	Yes	Both	Vandalism
Traffic Cell	Moderate to high	Yes	System	Requires transit improvements

Figure 2

A SAMPLER OF LESSER-KNOWN RESIDENTIAL TRAFFIC CONTROL STRATEGIES

- Speed Humps. Also known as road humps, undulations, or "sleeping policemen," speed humps were developed by the Transport and Road Research Laboratory (TRRL) in Great Britian. The purpose of speed humps is to promote the smooth flow of traffic at slow speeds (around 20 to 25 miles per hour); they are not meant to reduce vehicle speeds to 5 to 10 miles per hour as are speed bumps. They have undergone extensive demonstration and evaluation in both Britain and the United States. Findings from this research are contained in the FHWA report, Improving the Residential Street Environment (1981).

  The device is a an elongated hump of circular-arc cross section raising to a maximum height of four inches (10 cm) above the normal pavement surface and having a chord distance of 12 feet (3.65 m) in the direction of vehicular travel. They have proven to be more effective, quiet, and safe than conventional speed bumps.

  Humps are extremely effective in reducing traffic speeds to levels reasonable on local residential streets. Substantial reductions in the speeds of the fastest cars can be expected along with an 85th percentile speed of about 25 mph (40 kmph). Typical average speeds on hump-equipped streets are under 20 mph (32 kmph). Although humps can be traversed safely at high speeds, virtually no drivers do so.

  Speed humps have typically diverted some traffic from the streets where they were installed. Diversions of 20 to 23 percent were observed in several FHWA demonstrations.

  If used individually, humps act as a point speed control, comparable to a stop sign. Effective speed control along entire street segments has been demonstrated with hump spacing of 160 to 750 feet (49 to 228m).

  Emergency and long wheelbase vehicles can traverse speed humps but do encounter more severe effects than automobiles, cycles, or pick-up trucks. Thus, humps should not be installed on major emergency vehicle access routes, transit routes, or streets used frequently by heavy trucks.

  The FHWA estimates the cost of speed humps at roughly $500 each for engineering design and construction. This does not include priminary planning and community involvement costs.

- Play Streets. Although not a new concept, play streets are little known among traffic engineers. A play street is a street temporily closed to traffic for the benefit of residents and neighborhood children. Play streets were found in U.S. cities as early as 1909, and by 1929, 36 cities had closed 165 streets to through traffic to permit supervised child play.[15] In 1975 the only U.S. cities with significant play street programs were New York City and Philadelphia, which together operated about 550 during the summer season.

Play streets are usually sponsored by block associations or community organizations. Many are operated with supervisors and temporary play equipment. Most are in lower income areas where inadequate recreational space is available. Streets are temporarily closed during specified hours using wooden barriers, parked cars, or strings of signs. Play streets are effective in reducing accidents, particularly those involving children, and are very inexpensive to operate. The safety of access routes to play streets is an important related issue.

- Private Streets. These also have been found in the U.S. for many decades, but generally only in exclusive preserves of the wealthy. In recent years, however, St. Louis, Missouri, has transferred ownership of several street blocks to residents' associations, representing moderate income urban dwellers.

  With control of the street in the hands of residents, entry portals and gates have been installed to prevent through traffic. Residents bear the costs of services formerly provided by the city--street, light, and sidewalk maintenance, leaf sweeping, and snow plowing--which typically run about $50 per year for each household. Residents of the 5300 block of Waterman Boulevard in St. Louis, for example, also pay about $300 per household annually for the amortized cost of their street's entry portal and gate.

  This program has made it safe for children to play in their street, reduced crime, and boosted property values for residents, as well as cut costs for the City. Because residents control the street, they can also bar new construction and apartment conversions.

- Woonerf is a Dutch term for an area in which the residential function clearly predominates over provisions for traffic. This functional priority is clearly expressed in the physical design and layout of the street space. Pedestrians, bicyclists, children at play, and automobiles share a common space in a woonerf. No distinction is made between sidewalk and street. Cars are slowed to the pace of pedestrians by narrow curvilinear paths, trees, parking areas, and planters. Thus, automobile access for residents is maintained, while through traffic is eliminated.

  Boston and Cambridge, Massachusetts, and Rochester, New York, are presently constructing or planning woonerf streets. More than 800 woonerven (residential precincts) have been created in the Netherlands since 1976. Many similar residential precincts have been developed in West Germany, Denmark, Sweden, Belguim, and France. Columbia, South Carolina, is introducing the woonerf concept in the new residential development of Wheeler Hill, now under construction.

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[15] M.L. Reiss and A.E. Shinder, School Trip Safety and Urban Play Areas: Volume VII - Guidelines for the Creation and Operation of Urban Play Streets, (Washington, D.C.: Federal Highway Administration, November 1975), p. 1.

The woonerf concept has the greatest potential where extensive street reconstruction is required. Costs can amount to 30 to 40 percent more than conventional street reconstruction. In Rochester, New York, where a deteriorated 400 foot (145m) street in a low income neighborhood is being considered for a woonerf, standard reconstruction cost is estimated at $80-90,000, while full woonerf treatment would cost $120-130,000.

- Traffic Cells. A form of automobile restraint that has been used in a number of European cities and Japan, traffic cells prevent through auto traffic in central areas and dense residential neighborhoods. The Downtown Crossing in Boston (see map, Figure 3) is a limited version of this concept. City centers or residential areas bounded by main roads are divided into a series of "cells." An automobile driver who wishes to drive from one cell to another must use the "ring" or boundary road to make the trip, for automobiles are barred from crossing interior cell boundaries. Transit vehicles, cyclists, and pedestrians, however, may cross them freely.

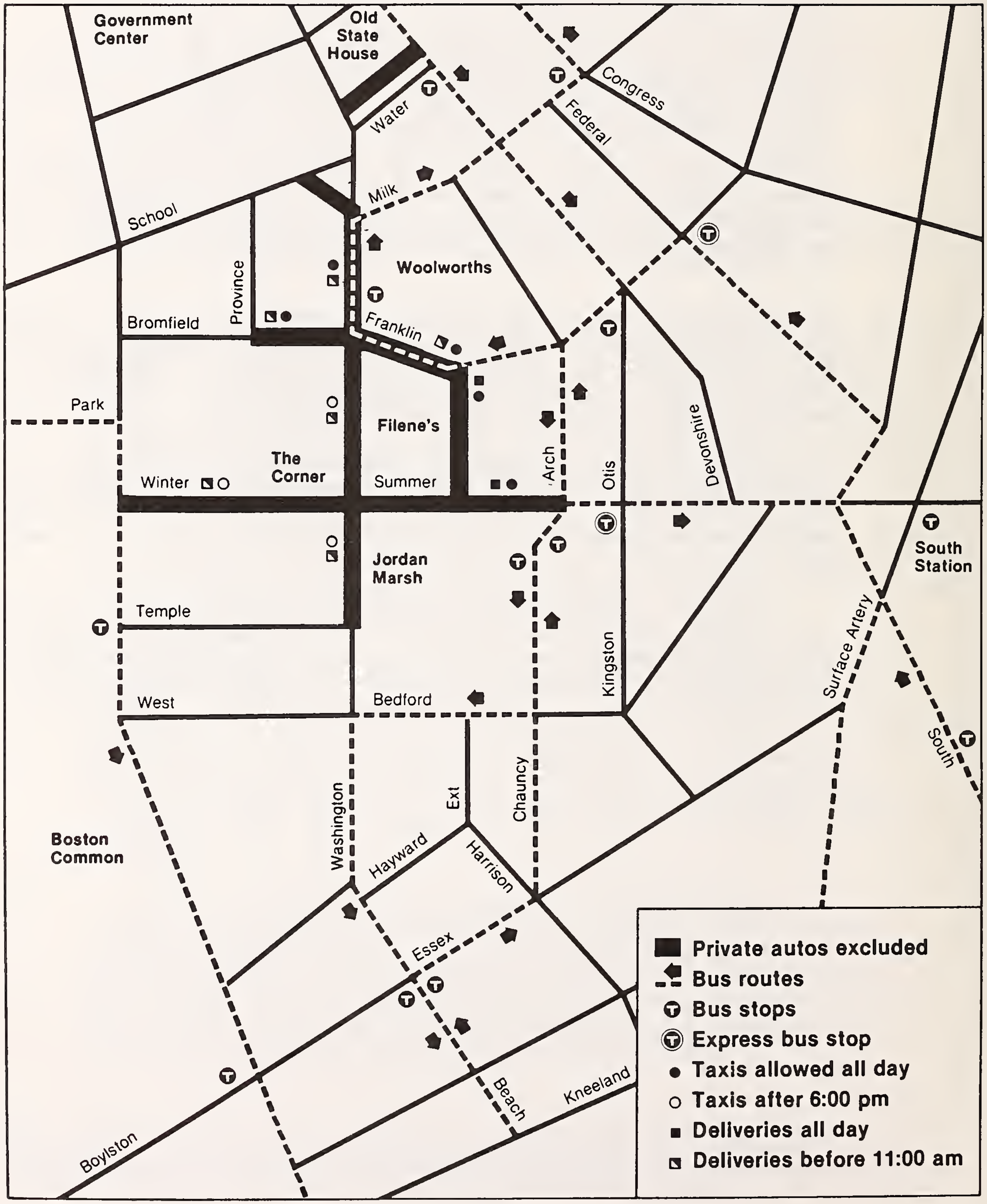
Traffic cells thus shift traffic from the interior to the periphery of the affected area and encourage alternate modes of transportation. Bus priority measures, parking restrictions, transit improvements, pedestrian streets, bicycle facilities, and other traffic management measures often are combined with traffic cells.

Traffic cells in a residential neighborhood can substantially reduce traffic, some elements of air pollution, and noise levels within the cell. The impacts of traffic can be shifted to the ring roads, which ordinarily are areas of non-residential or highrise residential land use.

Political controversy may accompany initiation of traffic restraints such as this, but traffic cells have won wide acceptance where they have been tried. Nagoya, Japan, Stockholm, Sweden, and Delft, Netherlands, are among the cities using traffic cells in urban residential areas.

Figure 3

Circulation Pattern



ISSUES IN DEVELOPING SUCCESSFUL NEIGHBORHOOD TRAFFIC CONTROL PROGRAMS

Local government officials face many difficult issues related to neighborhood traffic control programs. These issues, as identified by members of the Urban Consortium's Transportation Task Force, include:

- Should local governments become involved in neighborhood traffic control issues only when citizens or organized interest groups apply political pressure? Alternately, should neighborhood traffic control strategies be integrated into the local transportation planning and programming process as an ordinary element of local government concern?

- Data on traffic volume and speed is easy to collect. However, information about how residents perceive local traffic problems is difficult to obtain with reliability. What means can local governments use to establish better communication between residents and transportation agencies about local problems?

- How can conflicting and competing interests related to neighborhood traffic management be resolved with the least amount of political controversy? Of particular concern are conflicts between suburban and urban interests, automobile interest groups and neighborhood groups pressing for auto restraint, and conflicts between residents of the same neighborhood over accessibility vs. an improved residential environment or over diversion of traffic from one residential street to another.

- It is more practical to implement spot improvements which can improve a difficult intersection for its immediate neighborhood and may encounter less organized or widespread resistance or should a jurisdiction press for area wide improvements which offer a comprehensive strategic response to neighborhood traffic problems but may encounter stiff opposition?

- How do various general transportation policies and programs affect the level of traffic impacts in residential areas? For example, creation of a one-way street may improve traffic flow but have undesirable effects on the adjacent residences by fostering increased traffic volume on that street. How can land use and transportation policy reduce the need for neighborhood traffic management in a politically pragmatic manner?

ANALYZING PROBLEMS AND EVALUATING SOLUTIONS

Local transportation agencies responding to citizen complaints about traffic on residential streets have used a variety of approaches to assess the nature and scope of local traffic problems and to evaluate possible solutions. Some local governments, such as Berkeley, California, have taken bold initiatives and created areawide residential traffic management plans. Others have moved with hesitation on a piecemeal basis, responding only when a particular neighborhood has applied strong political pressure. A number of communities, such as Seattle, have established a formal process for considering neighborhood traffic control requests, with clearly defined criteria for project approval.

Many neighborhood traffic management programs have failed because of a breakdown in the planning process or the lack of a structured process. Because of the highly local and sensitive nature of traffic problems on residential streets, extensive public participation is vital to the success of neighborhood traffic management efforts. Effective participation and decision-making is best ensured by the development of a well-organized planning process.

Neighborhood traffic controls may evoke strong protests from motorists (both from outside and inside the neighborhood) whose driving patterns are affected, residents of streets to which traffic may be diverted, and merchants and professional persons who are concerned about access to their places of business. As local officials know only too well, some of the most bitter personal and political battles have been fought over street closings and other efforts to restrict vehicle movement.

Thus, neighborhood traffic management programs need to rely on both public involvement and technical analysis when evaluating the problems of a particular area. Many indicators need to be assessed to determine the exact nature of highly local traffic problems. Traffic data alone often is insufficient. If a large minority of residents of a block, street, or area complain about some condition, then there is some kind of problem, even if conventional traffic data does not reveal it.[16] A number of techniques and measures for evaluating neighborhood traffic problems are shown in Figure 4.

WARRANTS AND LEGAL ISSUES

Many local officials feel that the warrants found in the Manual on Uniform Traffic Control Devices are quite inappropriate for use in residential neighborhoods. They believe that the Manual should be revised to reflect actual conditions found in residential areas and the objective of protecting residential amenities. The warrants found in the Manual were designed to facilitate traffic flow, not to deal with neighborhood traffic management issues. Some local governments have developed and adopted their own warrants for neighborhood traffic controls. These vary widely from one jurisdiction to another, depending on local values, problems, political conditions, and goals.

Local officials are also concerned by the tort liability to which the individual may be exposed either in ignoring or applying Manual warrants in connection with residential neighborhoods. In the past, adherence to warrants has been considered a defense against tort liability under the principle of design immunity. More recently, however, some courts have found liability when the Manual was followed in circumstances where the warrants have been deemed to be inappropriate or after notice that the use of adopted warrants was creating a hazard.

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[16] Daniel T. Smith, Jr. and Donald Appleyard, et.al. State of the Art Report: Residential Traffic Management, (Washington, DC: Federal Highway Administration, 1980) p. 84.

Figure 4

TECHNIQUES AND MEASURES FOR EVALUATING NEIGHBORHOOD TRAFFIC PROBLEMS

TECHNIQUES	MEASURES	RESIDENT NEEDS: Safety	Children's Play	Walking, Cycling, Handicapped	Parking	Noise	Air Pollution	Appearance & Maintenance	Neighboring	Social Stability	Crime	TRAFFIC/SERVICE NEEDS: Vehicular Access	Emergency Services	Other Services
CITIZEN INPUTS	resident needs/values	◑	◑	◑	◑	◑	◑	◑	◑	◑	◑	◑		
	satisfaction/disturbance	◑	◑	◑	◑	◑	◑	◑	◑	◑	◑	◑		
	suggested improvements	◯	◯	◯	◯	◯		◯	◯	◯	◯	◯		
	traffic needs/velues											◯	○	○
TRAFFIC/SERVICE OBSERVATIONS	traffic volume	•	•	•		●		•	•			●	•	•
	speed	•	•	•		●		•	•			●	•	•
	perking	•	•	•	●			•				●		●
	composition	•	•	•		●		•				•		
	safety, conflicts	•	•	•								•		
	obedience	•	•	•								•		
	eccess											●	●	●
ENVIRONMENTAL OBSERVATIONS	traffic noise					●								
	treffic sefety conditions	●												
	street eccess										●	●	●	●
	welking, cycling & hendicepped conditions	●	●	●										
	spece analysis	●	●	•								•		
	visual quelity							●						
RESIDENT OBSERVATIONS	street ectivities	●	●	●					●					
	welking, cycling & hendicapped behavior	●		●										
	perking ectivities				●									
RECORDS	accidents	●	●	●										
	crime statistics										●			
	existing treffic counts	•	•	•		●		•	•			●	•	•
	census deta									○				
	lend use date									○				
	assessed velues									○				
	stetion end route inventories												●	●

● highly relevant and relieble
◯ highly relevent, somewhet relieble
• highly reliable, somewhet relevent
○ somewhat relevant and relieble
◑ highly relevant, reliability veries

Source: Smith, Daniel T. Jr. and Donald Appleyard, et.al. State of the Art Report: Residential Traffic Management, Washington, DC: Federal Highway Administration, 1980) p. 95.

A recent study by the legal staff of the Transportation Research Board reviews this issue in detail. The study concludes that, as long as a local or State department is permitted discretion in the regulation of traffic within its jurisdiction, there is little difference from the standpoint of negligence liability in using or not using the Manual. From a legal perspective it is more important that officials use considerable care in placing and maintaining devices, marking, and signs than it is to follow the Manual rigidly.[17, 18]

Other legal issues that must be considered by local officials in developing neighborhood traffic management schemes include:[19]

- Police Power of the Municipality. States ordinarily delegate their police powers to regulate and control use of motor vehicles on local public streets to municipalities. Enabling legislation is quite specific in some States and non-specific in others relative to local authority to close streets or install barriers or channelization devices. In recent cases, courts have disregarded the specificity of this enabling legislation so long as evidence of harm and/or evidence of reasonableness was presented to the courts. This reemphasizes the importance of good planning procedures.

- Reasonableness in the Exercise of Police Power. Courts have considered the following factors as significant in deciding whether neighborhood traffic control strategies were arbitrary, capricious, or unreasonable:

  -- Evidence of harm, including traffic accidents and counts, noise and air pollution, litter, fear of traffic, child safety concerns, and complaints of traffic nuisance.

  -- Traffic surveys.

  -- Prior trial application of less severe alternative traffic control measures.

  -- Consideration of inconvenience to residents in planning and design of measures.

  -- Integration of the diversion measures into areawide transportation planning.

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[17]Van Antwerp, Restraints, p. 55.

[18]W. Larry Thomas, Liability of State and Local Governments for Negligence Arising out of the Installation and Maintenance of Warning Signs, Traffic Lights, and Pavement Markings, NCHRP Research Results Digest No. 110, (Washington, DC: Transportation Research Board, April 1979).

[19]Adapted from Frederick Van Antwerp and James Miller, "Control of Traffic in Residential Neighborhoods: Some Considerations for Implementation," Transportation, 10 (1981), pp. 45-47.

-- Consideration for emergency vehicle access in strategy design.

-- Public hearings and participation.

-- Other factors, such as citizen petitions requesting the action.

- Rights of Access. The Supreme Court has ruled that "A community may also decide that restrictions on the flow of outside traffic into a particular residential area would enhance the quality of life thereby reducing noise, traffic hazard, and litter. By definition, discrimination against non-residents would inhere in such restrictions" (County Board of Arlington vs. Richards, 1977). Unless access to property has been denied completely, the inconvenience suffered by the property holder has been disregarded as an incidental result of a lawful act.

Local governments may occasionally be subject to legal actions following implementation of neighborhood traffic management strategies. However, they ordinarily can defeat these challenges if they have instituted sound planning procedures including public participation and adequate evaluation of both quantitative and qualitative data on traffic impacts in the affected area.

Answers to these questions are far from simple. Local officials display no clear agreement in responding to them. Yet some generalizations can be proposed, based on local experiences with neighborhood traffic problems.

Active or Reactive Stance?

Many local traffic engineers have steered clear of neighborhood traffic issues unless citizen complaints or accident and safety problems called attention to the matter. In many such cases, local agencies have responded on an ad hoc basis to individual problems where noted.

This piecemeal approach has worked in many situations where traffic problems were not severe. However, the lack of a clearly defined planning process often has led to political controversy and program failure. Most highly successful ongoing neighborhood traffic management programs have employed well-defined planning and operating procedures.

The Seattle Neighborhood Traffic Control Program, for example, has developed its own Standard Operating Procedure. In the early 1970s, the City began installing neighborhood traffic controls in 20 "critical" residential areas on a demonstration basis, using funds from a City Bond Issue. Careful attention was given to public participation and traffic diversion problems. In 1978, the City institutionalized the program, providing $200,000 a year to address residential traffic problems where signing solutions were either inappropriate or ineffective.

Neighborhoods could be considered for projects if 60% of the residents within the "area of local access" signed petitions requesting City action to reduce the speed or volume of traffic. "Area of local access" is defined by the Seattle Street Department and may be an entire area bounded by principal arterial streets or as small as a one-block radius around a proposed traffic circle.

Once petitions were signed, traffic data was collected. Priority points were assigned to each candidate area based on reported collisions, traffic volumes, and traffic speeds. Candidates were then notified of the results, and neighborhood meetings were arranged for high priority areas. Following a public hearing and authorization by the Board of Public Works, temporary devices were installed on a demonstration basis. The City surveyed residents, held another neighborhood meeting, analyzed before-and-after project impacts, and conducted another public hearing before the Board of Public Works. The Board then recommended construction of a permanent device to the City Council if no problems had emerged in this process. The Council held a final hearing before approving permanent installation.

Using this process, the City developed three to four neighborhood traffic management projects each year between 1978 and 1980. The program has proved very successful.

For example, a study of 14 problem intersections where traffic circles were installed showed that, for a five year period before and after installation, total reported collisions within the intersections dropped from 51.6 to 2.2 (based on extrapolated data). Accidents within a one-block radius of the circles declined from 101 to 33 over the same period. The resulting benefit-cost ratio for these traffic circles was 5.96. Traffic speeds were reduced as intended, and residents of other neighborhoods have begun seeking projects for their areas.

Because the procedure outlined above was intended to respond only to complaints from residents, there was concern among City staff that program funds were not always optimally allocated. Thus, in 1981, the City developed a ranked, residential collision-rate list to identify the most serious neighborhood safety problems where traffic circles might offer relief.

Instead of reacting to citizen complaints, the City now initiates citizen contact based upon the top ranked problems on its list. Residents of the affected area are surveyed to determine their support or opposition. If 60% approve, the City sponsors a neighborhood meeting to coordinate with local interests. Where the residents support a project, a permanent, low-cost traffic circle is installed.

Early permanent traffic circles in Seattle cost the City about $25,000. This cost has been cut to $5,000 each for a simpler, yet attractive design. Demonstration traffic circles cost the City about $500.

The City evalutes each project after six months of operation, and surveys residents if complaints have been received. The 19 circles programmed for 1981 are being reviewed at a single City-wide public hearing to judge whether any should be removed.

This revised Standard Operating Procedure for traffic circle projects allows the City to install many more devices within a limited budget. Projects involving cul-de-sacs, diagonal diverters, and curb extensions in Seattle still require citizen initiative as before, although funds for these projects are now scarce due to the emphasis being placed on traffic circles.

Local governments often maintain a reactive stance to neighborhood traffic control issues, hoping to minimize political controversy. While in many cases this is a judicious course to follow, Seattle has demonstrated that a carefully designed and managed neighborhood traffic control program can generate political support by pursuing new projects in areas where citizens are less well organized. Public participation remains essential,but the City now provides leadership in dealing with neighborhood traffic problems, rather than merely responding to complaints.

Public Participation and Conflict Resolution

Successful planning for residential traffic management requires consideration of many fine-grained details concerning residents' perceptions of the problems, people's behavior in using the street, and precise physical conditions and constraints. Because traffic management is inherently controversial and involves details of usage and behavior known only to residents, community involvement is essential in planning projects.

There are many potential pitfalls in conducting public participation efforts for neighborhood traffic management. For example, the City of San Francisco worked for many months with residents of the Inner Richmond neighborhood on a project intended to reduce traffic on several neighborhood streets. Because of administrative procedures, construction of traffic diverters did not begin until two years after agreement was reached between the City and neighborhood groups. In this period, some of the key supporters of traffic controls moved from the neighborhood, and many new residents moved in. Although there had been significant participation by neighborhood groups in requesting and obtaining the diverters, these groups did not represent the full affected residential community. Once the concrete was poured for the new diverters, citizen protest was loud. In the end, the traffic diverters were taken out, and citizens passed a referendum barring the City from future traffic diversion measures.

Great care must be taken in designing an appropriate participation process that permits affected interests to be heard. Information should be made available freely to retain or create greater trust and credibility between local transportation agencies and citizens. Personnel skilled in community involvement should be dedicated to neighborhood traffic management project teams. Whenever possible, existing neighborhood organizations should be drawn into the planning and design process with responsible outreach roles. Yet, involvement should not be restricted to residents active in such organizations. As a general rule, multiple channels and means for communication between residents and local agencies should be developed.

An open planning process can minimize conflicts over neighborhood traffic management issues by dealing with disagreements as they arise. Unless residents of an area are already familiar with and support a particular neighborhood traffic restraint measure, it is useful to stress the trial nature of a new project. If a particular installation is not well received by residents, it can be withdrawn with little loss of face if it has been installed on a demonstration basis.

Incremental implementation of neighborhood traffic controls is desirable to reduce political conflict. However, some situations call for development of an areawide traffic management scheme within a short period of time. For example in 1975, Berkeley, California, implemented neighborhood traffic controls over a wide area, combined with TSM improvements on arterial streets. Although the Berkeley program was supported by the public in two referenda and deemed successful by the

City Council, the California Supreme Court in June, 1982 ruled the use of diverters, the plan's principle traffic control devices, illegal. The City is currently evaluating its response to the ruling.

Public participation and conflict resolution techniques related to neighborhood traffic management efforts are discussed at length in the recent FHWA report, State of the Art Report: Residential Traffic Management.

Transportation-Land Use Interaction

Many traffic problems on residential streets are symptomatic of deeper problems in urban transportation and land use policy. Often, unbalanced land development has overtaxed the existing transportation network, resulting in arterial street congestion and the spillover of traffic on to non-arterial residential streets.

A prime example of this can be found in the Silicon Valley, south of San Francisco. Dramatic growth in employment in the northwest corner of Santa Clara County, centered around Palo Alto and Stanford University, was accompanied by restrictive land use policies designed to preserve the spacious, rural character of the adjacent wealthy, residential communities. Seeking expanded tax bases, cities in this area rezoned much land from residential to industrial use. Between 1965 and 1975, this rezoning decreased potential housing capacity countywide by 43%, or 417,000 housing units. By 1980, there were over 670,000 jobs, but only 480,000 housing units in Santa Clara County.[20]

The housing shortage has forced thousands of workers, particularly blue-collar production employees, to live many miles from their jobs. As the least expensive homes and apartments are increasingly found only in the southern and eastern portions of the County, many workers are faced with automobile commute trips of three hours or more daily because of severe traffic congestion or unacceptable transit alternatives.

As a result of congestion, traffic spill-over has threatened many non-arterial residential streets. Palo Alto and other municipalities have had to focus much effort on TSM measures to alleviate arterial congestion and on neighborhood traffic controls to protect residential communities. Officials in the City of Palo Alto acknowledge that neighborhood traffic intrusion is merely a symptom that the larger transportation system is overtaxed.

On a smaller scale similarly unbalanced land development policies can be observed in most American cities. The lack of affordable housing adjacent to employment centers inevitably leads to longer work-trip lengths. This, in turn, ordinarily increases congestion on primary roads and spillover onto residential streets.

For several decades, transportation planning and policy have been concerned with longer trips while giving less attention to the needs of those making short trips. Yet, over 60 percent of all trips in urban areas are under five miles in length. A number of reasons for this can be cited:

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[20]Anna Lee Saxenian, "Outgrowing the Valley," Working Papers for a New Society, Vol. VIII, no. 5 (September-October 1981). pp. 24-27.

- U.S. planners rely heavily on computer models that cannot deal with short trips cost-effectively. Thus, it has been easy to neglect pedestrians, paratransit, bicycles, and shorter trips in general when modeling transportation demand and investment needs.

- Transportation System Management (TSM) strategies have focused on reducing vehicle miles traveled (VMT) without distinguishing between long and short trip VMT reductions. However, short automobile trips use gasoline and emit pollution at up to five times the rate per mile of longer trips.

In many cases, the need for neighborhood traffic management can be reduced over the long-term by promoting mixed use developments and higher densities along transportation corridors and nodes, with a strengthening of secondary activity. Promotion of bicycle, pedestrian, and transit modes can reduce future residential traffic intrusion as well.

CONCLUSION

Neighborhood traffic problems pose both great difficulties and substantial opportunities for local transportation officials. While many programs for residential traffic management have failed due to unanticipated political or legal problems, others have generated strong political support because they succeeded in improving the quality of residential environments.

In many cities, such as Palo Alto, Seattle, and Washington, D.C., neighborhood traffic control programs have fostered new neighborhood organizations and strengthened old ones. These have often served as seedbeds for developing new political leaders and grass-roots coalitions.

Neighborhood traffic management schemes alone will not transform the quality of life in metropolitan America nor bring about a new generation of political leaders. However, they can play an important role in the revitalization of American cities in the 1980s. In order to be implemented successfully, they require the combined efforts of citizens and responsible public leaders.

Chapter 2

CONTACTS AND CURRENT PROGRAMS

Because of the wide range of activities that pertain to neighborhood traffic controls and impacts of traffic on residential areas, a comprehensive listing of contacts and programs is beyond the scope of this document. The list below represents a cross-section of important contacts and programs as starting points for more detailed inquiries.

U.S. DEPARTMENT OF TRANSPORTATION

Office of the Secretary

- Assistant Secretary for Governmental Affairs
  Provides a variety of technical and general information to State and local governments.

  Contact: Al Linhares
  Office of Technology and Planning Assistance (I-30)
  400 7th Street SW
  Washington, DC 20590
  (202) 426-4208

Federal Highway Administration

- Urban Planning Division
  General information on residential traffic management strategies and access to technical assistance.

  Contact: Gary Maring
  Community and Environmental Planning Branch
  FHWA (HHP-23)
  400 7th Street, SW
  Washington, DC 20590
  (202) 426-0215

- Office of Engineering
  Information on funding and eligibility related to neighborhood traffic management.

  Contact: Larry Staron
  Programs Branch (HNG-12)
  400 7th Street, SW
  Washington, DC 20590
  (202) 426-0450

- Office of Traffic Operations
  General information on neighborhood traffic controls.

Contact: Chester F. Phillips
Traffic Operations Programs Branch (HTO-34)
400 7th Street, SW
Washington, DC 20590
(202) 426-0323

- Office of Research
  Has published several reports on neighborhood traffic management and problems.
  Contact: John C. Fegan
  Project Manager (HRS-41)
  400 7th Street, SW
  Washington, DC 20590
  (202) 426-9710

Federal financial assistance in the installation of neighborhood traffic controls may be sought under two programs, both of which are administered through State highway agencies.

- Federal-Aid Urban Systems (Chap. 1, 23 U.S.C.). This program covers traffic improvements on Federal Aid System (FAU System) streets and streets leading to the FAU System. Federal share is 75%.

- Safer Off-System Roads Program (Section 219, 23 U.S.C.). This program covers a wide range of safety improvements on streets that are not on the FAU System. Federal share is 75%.

LOCAL CONTACTS AND PROGRAMS

Figure 5 illustrates the large number of localities using different neighborhood traffic management strategies in the United States. While not a comprehensive list, it may suggest how jurisdictions comparable to your own have dealt wtih these problems.

- Berkeley, California, implemented an areawide neighborhood traffic management plan in 1975.

  Contact: Herman Sinemus, P.E.
  Traffic Engineer
  City of Berkeley
  2180 Milvia Street
  Berkeley, CA 94704
  (415) 644-6517

- Cambridge, Massachusetts, is working to develop a woonerf adjacent to a school.

  Contact: Elizabeth Ware
  Department of Community Development
  57 Inman Street
  Cambridge, MA 02139
  (617) 498-9034

Figure 5

A SAMPLER OF NEIGHBORHOOD TRAFFIC MANAGEMENT DEVICES USED IN NORTH AMERICAN LOCALITIES

Jurisdiction	Diagonal Diverters	Semi-Diverters	Cul-de-Sac/Street Closures	One-way Streets/Do Not Enter	Improve Major Streets	Rumble Strips	Bumps, Undulations	Stop Signs	Chokers/Narrowing	Traffic Circles	Traffic Signals	Turn Prohibitions	Forced Turns	Special Parking Restrictions	Median Barriers	Enforce Speed Laws	Truck Prohibitions	Special Signs/Speed Limit Signs
Fort Worth, Texas								●								●		
St. Joseph, Michigan								●										
Boston, Massachusetts							●		●								●	
Pittsburgh, PA								●			●							●
Inglewood, CA	●							●										
Traverse City, Michigan								●										
Claremont, CA																	●	●
Campbell, CA			●													●		●
Dartmouth, Canada							●	●										●
Omaha, Nebraska			●															
Davis, CA	●		●					●										
Akron, Ohio								●										
Torrance, CA			●	●			●					●			●			●
Beverly Hills, CA								●										
Detroit, Michigan												●						
Oklahoma City, OK				●			●											●
Simi Valley, CA			●															
Santa Cruz, CA								●										
Buena Park, CA								●							●			
Redondo Beach, CA			●															
Alexandria, VA			●															
Halifax, Nova Scotia			●					●				●	●					●
Oakville, Canada								●										
Littleton, Colorado			●												●			●
Tampa, Florida			●															
Jacksonville, Florida								●										●
Dallas, Texas			●					●										●
Dayton, Ohio	●		●	●					●									
Cambridge, MA				●				●						●			●	
San Luis Obispo, CA								●										
Sacramento, CA	●																	
New Haven, CT					●			●										
New Orleans, LA				●								●		●				●
Philadelphia, PA				●				●									●	
Rochester, NY				●				●										
Toledo, OH	●																	
St. Petersburg, Florida								●										
Washington, D.C.	●			●			●	●				●		●				●

Jurisdictions reporting neighborhood traffic control devices

Figure 5 (con'd)

Jurisdiction	Diagonal Diverters	Semi-Diverters	Cul-de-Sac/Street Closures	One-way Streets/Do Not Enter	Improve Major Streets	Rumble Strips	Bumps, Undulations	Stop Signs	Chokers/Narrowing	Traffic Circles	Traffic Signals	Turn Prohibitions	Forced Turns	Special Parking Restrictions	Median Barriers	Enforce Speed Laws	Truck Prohibitions	Special Signs/Speed Limit Signs
San Jose, CA							●											
Sacramento Co., CA										●								
Cupertino, CA								●	●									
Saratoga, CA								●		●		●	●					●
Carson, CA															●			
Covina, CA								●										
Cyprus, CA			●															
Downey, CA			●												●			
Glendale, CA								●										
Hawthorne, CA												●						
Huntington Beach, CA													●					
Irvine, CA															●			
Los Angeles, CA			●					●										
Norwalk, CA			●															
Pasadena, CA	●																	
Placentia, CA															●			
Rancho-Palos Verdes, CA															●			
South Pasadena, CA			●															
Whittier, CA			●															
Oakland, CA	●								●									
San Diego, CA									●									
Belmont, CA			●															
San Mateo, CA		●	●		●					●								
Menlo Park, CA	●		●															
Lafayette, CA								●	●			●				●		
Richmond, CA	●		●										●					
Albany, CA															●			
Redwood City, CA															●			
Walnut Creek, CA		●	●															●
Pleasant Hill, CA		●																
Skokie, Illinois																		●
Columbus, Ohio								●										
Louisville, KY	●			●														
Hartford, CT			●															
Chicago, Illinois	●		●	●				●										
Minneapolis, Minnesota	●												●					
Grand Rapids, Michigan	●		●															
Metuchen, NJ			●															

Jurisdictions reporting neighborhood traffic control devices (continued)

Figure 5 (con'd)

Jurisdiction	Diagonal Diverters	Semi-Diverters	Cul-de-Sac/Street Closures	One-way Streets/Do Not Enter	Improve Major Streets	Rumble Strips	Bumps, Undulations	Stop Signs	Chokers/Narrowing	Traffic Circles	Traffic Signals	Turn Prohibitions	Forced Turns	Special Parking Restrictions	Median Barriers	Enforce Speed Laws	Truck Prohibitions	Special Signs/Speed Limit Signs
Buffalo, NY				●								●						
Concord, MA								●									●	
Flint, Michigan								●										●
Houston, Texas			●									●						
Keane, NH								●										
Memphis, Tennessee				●														●
Miami, Florida					●					●		●						
Nashville, Tennessee	●														●			●
Isla Vista, CA			●															
Aurora, CA	●		●					●			●	●						●
Charlotte, NC						●						●			●			
Cleveland, Ohio			●	●								●	●					
Berkeley, CA	●	●	●					●	●	●	●	●	●		●			●
Decatur, Illinois	●			●				●	●				●	●	●			●
El Paso, Texas			●															
Farmington, Utah			●				●	●						●	●			●
Hampton, VA	●			●					●				●					
Kalamazoo, Michigan				●				●				●	●	●				
Kansas City, MO				●														
Lake Oswego, OR	●			●														
Madison, Wisconsin	●		●	●				●	●	●	●		●	●				●
Norfolk, VA												●					●	
Palo Alto, CA	●		●					●			●				●			
Rocky Mount, NC			●	●				●			●	●	●	●	●			●
St. Louis, MO	●		●	●			●	●	●									
St. Paul, Minnesota	●		●					●						●				
Salt Lake, Utah				●														
San Francisco, CA		●			●		●		●			●	●	●			●	
Santa Ana, CA	●		●									●	●					
Seattle, WA	●	●	●				●	●		●			●	●				●
Shaker Heights, Ohio	●	●	●	●					●				●	●				●
Springfield, MA									●									
Vancouver, BC	●		●				●			●			●					
Visalia, CA									●									
Wichita, Kansas	●	●	●										●					
Toronto, Ontario							●											
Concord, CA								●							●			

Jurisdictions reporting neighborhood traffic control devices (continued)

Figure 5 (con'd)

Jurisdiction	Diagonal Diverters	Semi-Diverters	Cul-de-Sac/Street Closures	One-way Streets/Do Not Enter	Improve Major Streets	Rumble Strips	Bumps, Undulations	Stop Signs	Chokers/Narrowing	Traffic Circles	Traffic Signals	Turn Prohibitions	Forced Turns	Special Parking Restrictions	Median Barriers	Enforce Speed Laws	Truck Prohibitions	Special Signs/Speed Limit Signs
Eugene, OR	●	●	●	●					●	●					●			
Joliet, Illinois	●										●							
Portland, OR	●	●	●						●									
Baltimore, MD																		
Tucson, AZ																		

Jurisdictions reporting neighborhood traffic control devices (continued)

NOTE: Figure 5 is by no means a complete summary of all jurisdictions believed to be using various devices cited. It is simply a notation of those neighbhorhood traffic control devices observed or reported in the above communities. Many more North American jurisdictions are believed to be using some of these devices for neighborhood traffic control purposes. Jurisdictions cited above may also use other devices not indicated on the table. Some devices indicated above are test installations subsequently removed.

Source: Smith, Daniel T. Jr. and Donald Appleyard. State of the Art: Residential Traffic Management. pp. 169-172.

- Palo Alto, California, has a long-standing neighborhood trafficmanagement program.

  Contact: Ted Nagouchi, PE
  Director of Transportation
  City of Palo Alto
  City Hall
  Palo Alto, CA 94301
  (415) 329-2160

- Rochester, New York, is planning to install a woonerf in a low income neighborhood in 1982.

  Contact: John E. Thomas
  Transportation Planner
  Rochester Bureau of Planning and Zoning
  City Hall, 30 Church Street
  Rochester, NY 14614
  (716) 428-6824

- St. Louis has done neighborhood traffic management work, including selling streets to adjoining property owners.

  Contact: Earl Ray, PE
  Deputy Traffic and Transportation Administration
  1900 Hampton Avenue
  St. Louis, MO 63139
  (314) 647-3111 Sta. 45

- Seattle, Washington, has a very successful neighborhood traffic management program.

  Contact: Bill Van Gelder or Jim Dare
  Neighborhood Traffic Control Program
  City of Seattle Engineering Department
  708 Municipal Building
  600 4th Avenue
  Seattle, WA 98104
  (206) 625-2347

- Washington, D.C., has developed a neighborhood traffic planning unit to deal with traffic problems in residential areas.

  Contact: Bart Cima
  D.C. Department of Transportation
  415 12th Street NW
  Washington, DC 20004
  (202) 727-5843

OTHER CONTACTS AND PROGRAMS

- The Touring Club Suisse, the Swiss version of the American Automobile Association, has developed an imaginative scheme to promote neighborhood traffic restraints in cooperation with Pro Juventute, a national foundation concerned with the well-being of youth. A furniture van, equipped with the elements needed to demonstrate what a residential, traffic-restrained street would look like, has been made available without charge to communities in Switzerland. A demonstration of the woonerf-type street layout is set up for several days in a neighborhood considering traffic controls, to allow residents to see what the woonerf would do to their area. Demonstration elements include temporary street furniture, mock-up trees, bollards, speed humps, astroturf, and bicycle parking racks.

  Contact: George Wynne
  Director of Communications
  Council for International Urban Liaison
  818 18th Street NW
  Washington, DC 20006
  (202) 223-1434

Chapter 3

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Report on a study of the use of speed bumps by the Transportation Division of the City of San Jose, California. Concludes that speed bumps are not effective in reducing vehicle speeds and that they are both unsafe and noisy.

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Not on speed bumps. Comments briefly on the experience with traffic diverters in Seattle, Washington, and Berkeley, California.

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A review of the Dutch experience with woonerven, or residential precincts. Discusses benefits and costs, planning and implementation issues and process. Illustrated in color.

Appleyard, Donald with M. Sue Gerson and Mark Lintell. Livable Streets. Berkeley: University of California Press, 1981.

A comprehensive study of the effects of traffic on selected residential neighborhoods in San Francisco, supported by data on protecting neighborhoods in San Francisco, Oakland, and Berkeley, and in the United Kingdom, Sweden, Holland, Denmark, Germany, Italy, Australia, Japan, India, and Thailand. Discusses and evaluates alternative strategies. Contains an extensive bibliography.

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Compares property values over a thirty year period between two contiguous neighborhoods identical in every respect except for residential traffic management.

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Includes the full text of papers presented and reports on the panel discussions, site visits, and talks given during a week-long symposium. The event brought together some 40 German and U.S. local, state, and Federal officials, traffic engineers, planners, and academics for an exchange of experiences related to neighborhood traffic restraint.

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Improving the Residential Street Environment - Final Report. DeLeuw, Cather and Co. for the Federal Highway Administration, Washington, D.C.: GPO, 1981. (Report No. FHWA/RD-81-031). 149 pp.

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